

## **REMARKS**

Claims 1-15 were pending in the present application. By virtue of this response, claims 1, 4, and 13-15 have been amended without prejudice or disclaimer of any previously claimed subject matter, and new claim 16 has been added. Support for the amendments and new claim may be found in the claims as originally filed and throughout the present application. Accordingly, claims 1-16 are currently under consideration. Amendment of certain claims is not to be construed as a dedication to the public of any of the subject matter of the claims as previously presented.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attachment is entitled "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

### **Allowable Subject Matter**

Applicants thank the Examiner for the indication of allowable subject matter. Specifically, claims 14 and 15 were objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. As indicated by the amendment above, claims 14 and 15 have been amended into independent form including the limitations of the respective base claims. Accordingly, Applicants request allowance of claims 14 and 15.

### **Drawings**

A proposed drawing correction to Figure 13 is submitted herewith. In particular, Figure 13 has been amended to include the legend "Related Art."

### **Rejections under 35 U.S.C. §102(b) and (e)**

A. Claims 1-4 and 6-11 stand rejected under 35 U.S.C. § 102 (e) as being anticipated by Fujimoto et al. (U.S. Patent No. 6,242,761).

Applicants submit that Fujimoto et al. do not disclose or suggest a gallium nitride compound semiconductor light-emitting diode wherein “the n-type transmissive electrode and p-type transmissive electrode are thin films so as to be substantially transparent,” as recited in amended claim 1. Support for the amendment to claim 1 may be found, for example, on page 17, lines 10-15 of the present application.

The Examiner maintains the rejection of the previous Office Action (paper No. 6) where it was stated that the n-type transmissive electrode of Fujimoto et al. is substantially transparent “because of the inherent material properties and structure disclosed. In re Best, 195 USPQ 430, 433 (CCPA 1997).” (emphasis added). Further, in response to Applicants arguments in the previous amendment filed on September 9, 2002, the Examiner maintains the position that the “Fujimoto device comprises material substantially identical to that of the subject claimed; thus it would be substantially transparent, which meets the claim language.”

The n-type electrodes of Fujimoto et al., however, are not “thin films so as to be substantially transparent,” as recited in amended claim 1. Rather, the n-type electrode 130 of Fujimoto et al. is formed of a stacked structure of 50 nm-thick Ti and 0.5  $\mu\text{m}$ -thick Au. Fujimoto et al., col. 6, line 66 to col. 7, line 3. The n-type electrode of Fujimoto et al. comprise a stacked structure of metal layers, and while the n-type electrode of Fujimoto et al. may include similar materials as the n-type electrode of claim 1, the structure is completely different. Therefore, the electrode of Fujimoto et al. is at least 550 nm thick, which is clearly not a thin film that is substantially transparent to light as recited in amended claim 1. The rejection should be withdrawn.

The amendment to claim 1 clarifies that the n-type transmissive electrode and p-type transmissive electrode are “thin films so as to be substantially transparent,” for example, by being on the order of a few nanometers, e.g., 2 – 30 nm, such that they are substantially transparent. See, e.g., the present application at page 14, line 1; page 18, line 17; page 21, line 16; and page 33, line 21. Therefore, the combination of structure and material recited in amended claim 1 leads to the “substantially transparent” nature of the n-type electrode of claim 1, which is neither disclosed nor suggested by Fujimoto et al.

Further, it is noted that, with respect to claim 12, the Examiner states that Fujimoto et al. discloses “n-type and p-type transmissive electrode 130 and 131 are of a thickness of 50 nm, column 6 line 66 and 51 nm, column 7 lines 26-28.” Although this statement is in regard to claim 12 and not claim 1, Applicants believe the Examiner is in error as to the thickness of the electrodes disclosed in Fujimoto et al., which may influence the rejection to claim 1. The cited portions of Fujimoto et al., however, clearly disclose that “a stacked structure of 50 nm-thick Ti and 0.5  $\mu$ m-thick Au...is annealed...to form the n-type electrode 130.” (Emphasis added). The electrodes of Fujimoto are therefore at least 550 nm, which is not a thin film so as to be substantially transparent as recited in amended claim 1.

Accordingly, Applicants request withdrawal of the rejection and allowance of claims 1-4, and 6-11.

B. Claim 13 stands rejected under 35 U.S.C. § 102 (b) as being anticipated by Tamaki et al. (U.S. Patent No. 5,369,289).

Applicants submit that Tamaki et al. do not disclose or suggest a gallium nitride compound semiconductor light-emitting diode including “a conductive substrate ... a non-conductive buffer layer provided on the substrate ... wherein the n-type transmissive electrode is formed on the lower face of the substrate,” as recited in amended claim 13. Support for the

amendment to claim 13 may be found throughout the present application, for example, on page 20, line 22 and page 24, lines 9-10. An advantage of the structure recited by claim 13, for example, includes forestalling problems such as increased forward voltage or non-uniform current flow common in conventional LED structures. See, e.g., page 23, line 14 to page 24, line 10 of the present application.

Tamaki et al. do not disclose or suggest a gallium nitride compound semiconductor light-emitting diode as recited by amended claim 13 for at least the following reasons. First, Tamaki et al. do not disclose a conductive substrate as recited by claim 13. Rather, substrate 1 disclosed by Tamaki et al. is a sapphire substrate and therefore not a conductive substrate. Tamaki et al., col. 7, lines 15-20.

Second, Tamaki et al. do not disclose or suggest a non-conductive buffer layer as recited by amended claim 13. The AlN buffer layer 2 of Tamaki et al. is a semiconductor layer and not a non-conductive buffer layer as recited in the claim. Tamaki et al., col. 7, line 15.

Third, Tamaki et al. do not disclose or suggest an n-type electrode formed on the lower face of the substrate as recited by amended claim 13. See, for example, Figure 14 of Tamaki et al.

Therefore, Tamaki fails to disclose or suggest the gallium nitride compound semiconductor light-emitting diode as recited in amended claim 13. Accordingly, Applicants request withdrawal of the rejection and allowance of claim 13.

#### **Rejections under 35 U.S.C. §103(a)**

Claim 5 stands rejected under 35 U.S.C. § 103 (a) as being unpatentable over Fujimoto et al. (U.S. Patent No. 6,242,761) in view of Tamaki et al. (U.S. Patent No. 5,369,289).

Claim 5 depends from claim 1 and is allowable for at least similar reasons as stated above in regard to claim 1. The addition of Tamaki et al. fails to cure the deficiencies of Fujimoto et al.

as applied to claim 1, nor is it alleged to. Accordingly, Applicants respectfully request withdrawal of the rejection and allowance of claim 5.

## CONCLUSION

Applicants have, by way of the amendments and remarks presented herein, made a sincere effort to overcome rejections and address all issues that were raised in the outstanding Office Action. Accordingly, reconsideration and allowance of the pending claims are respectfully requested. If it is determined that a telephone conversation would expedite the prosecution of this application, the Examiner is invited to telephone the undersigned at the number given below.

In the unlikely event that the transmittal letter is separated from this document and the Patent Office determines that an extension and/or other relief is required, applicant petitions for any required relief including extensions of time and authorizes the Assistant Commissioner to charge the cost of such petitions and/or other fees due in connection with the filing of this document to **Deposit Account No. 03-1952**, referencing docket no. **299002051900**. However, the Assistant Commissioner is not authorized to charge the cost of the issue fee to the Deposit Account.

Respectfully submitted,

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By:

  
Christopher B. Eide  
Registration No. 48,375

Morrison & Foerster LLP  
755 Page Mill Road  
Palo Alto, California 94304-1018  
Telephone: (650) 813-5720  
Facsimile: (650) 494-0792

**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**In the Claims:**

Claims 1, 4 and 13-15 have been amended as follows:

1. (Amended) A gallium nitride compound semiconductor light-emitting diode comprising:

a substrate;  
an n-type electrode region comprising an n-type transmissive electrode;  
a gallium nitride compound semiconductor multilayer structure including an active layer; and  
a p-type electrode region comprising a p-type transmissive electrode, wherein the n-type transmissive electrode and p-type transmissive electrode are thin films so as to be substantially transparent.

4. (Amended) A gallium nitride compound semiconductor light-emitting diode according to claim 1, wherein the n-type transmissive electrode is formed at least partially around a circumference of the p-type transmissive electrode.

13. (Amended) A gallium nitride compound semiconductor light-emitting diode comprising:

a conductive substrate;  
an n-type electrode region comprising an n-type transmissive electrode;  
a non-conductive buffer layer provided on the substrate;  
a gallium nitride compound semiconductor multilayer structure including an active layer provided on the buffer layer; and  
a p-type electrode region comprising a p-type transmissive electrode provided on the gallium nitride compound semiconductor multilayer structure, wherein

the n-type transmissive electrode is formed on the lower face of the substrate, a side face of the substrate, a side face of the buffer layer, and a side face of the n-type gallium nitride compound semiconductor [layer] multilayer structure in a region neighboring the buffer layer.

14. (Amended) A gallium nitride compound semiconductor light emitting diode [according to claim 13,] comprising:

a substrate;

an n-type electrode region comprising an n-type transmissive electrode;

a buffer layer provided on the substrate;

a gallium nitride compound semiconductor multilayer

structure including an active layer provided on the buffer layer; and

a p-type electrode region comprising a p-type transmissive electrode provided on the gallium nitride compound semiconductor multilayer structure, wherein

the n-type transmissive electrode is formed on the lower face of the substrate, a side face of the substrate, a side face of the buffer layer, and a side face of the n-type gallium nitride compound semiconductor multilayer structure in a region neighboring the buffer layer, and

wherein the n-type transmissive electrode comprises an oxide semiconductor.

15. (Amended) A gallium nitride compound semiconductor light-emitting diode [according to claim 1,] comprising:

a substrate;

an n-type electrode region comprising an n-type transmissive electrode;

a gallium nitride compound semiconductor multilayer structure including an active layer; and

a p-type electrode region comprising a p-type transmissive electrode, wherein

the n-type transmissive electrode and p-type transmissive electrode are films so as  
to be substantially transparent, and

wherein the n-type transmissive electrode comprises a thick film of ITO.